The Investigation of Relaxation Processes in a Number of Fluorine-Carbon Compounds

SOV/56-35-2 8/60

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: March 14, 1958

Card 3/3

GRECHISHKIN, V. S., Cand Phys-Math Sci (diss) -- "Investigation of dynamic gradients of electrical fields of crystal lattices, using the method of nuclear quadripolar resonance". Leningrad, 1959. 9 pp (Leningrad Order of Lenin State U im A. A. Zhdanov), 225 copies (KL, No 9, 1960, 122)

21(7), 24(3)

AUTHOR: Grechishkin, V. S. SOV/54-59-2-2/24

TITLE: The Influence of Apparatus Factors on the Reproduction of the Line Shape in the Nuclear Quadrupole Resonance (Vliyaniye apparaturnykh faktorov na vosproizvedeniye formy liniy v yadernom kvadrupol'nom rezonanse)

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1959, Nr 2, pp 14-19 (USSR)

ABSTRACT: The lines of the nuclear quadrupole resonance suffer, by certain inner and outer factors, an extension which makes their investigation more difficult. In this connection, the investigations mentioned in the title on the reproducibility of the line shapes were carried out. The investigations concerned: 1) The influence of the amplitude modulation on the reproducibility of the mentioned lines. The formula for equivalent frequency modulation in case of nuclear quadrupole resonance, and magnetic modulation in case of magnetic resonance, is found here which is equal to the formula by Andrew (Ref 2):

Card 1/3

$S_2^* = S_2^o + \frac{\nu_m^2}{4}$ (1); for the case of separation of a secondary harmonic of the signal: $S_2^* = S_o^2 + \frac{\nu_m^2}{6}$ (6) (S_2^* = secondary moment found by experiment, S_2^o = exact secondary moment). This formula can be used for a correction of the experimental observation of the secondary moment. 2) Comparison of the frequency- and Zeeman-modulation from the standpoint of reproducibility of the line shape. The distortion is considered here which is caused by the time constant of the phase detector. The expression $S^* = S_2^o + 2(v\tau)^2$ (13) for the secondary moment is obtained. As with the Zeeman-modulation a distortion, as in formulas 1 or 6, is missing, the use of this modulation is more convenient than the frequency modulation. In the expression (13) v denotes the velocity of passage through the resonance area, τ the time constant of the phase detector. 3) Influence of the outer magnetic field. For the intensity of lines, an expression

is found here which is inversely proportional to the magnitude of the magnetic field and directly proportional to the width of lines. The surface under the curve remains unchanged.

$f = \pm \frac{4\tau^2}{\gamma H_0}$ (16). 4) Influence of the low frequency band filter. The passage of the signal through an ideal filter of low frequency is considered. The form factor of this correction is represented by a function (17) of the time of transverse relaxation and of the modulation frequency; by some conversions, it passes over into an expression which contains the Krampf function. If the argument of this function is complex, it is oscillating; the frequency of oscillation is represented by the width of lines, the amplitude by the filter band. Finally, the author thanks F. I. Skrinov for a number of valuable critical remarks and for his interest in the work. There are 2 references.

SUBMITTED: March 14, 1959

Card 3/3

SOV/120-59-2-8/50

AUTHOR: Grechishkin, V.S.

TITLE: Recording Line Shapes in Pure Quadrupole Resonance (Nablyudeniye formy liniy v chisto kvadrupol'nom rezonanse)

PERIODICAL: Pribory i tekhnika eksperimenta, 1959, Nr 2, pp 31-33 (USSR)

ABSTRACT: An apparatus for recording pure quadrupole resonance is described. Wang's circuit is used to reproduce line shapes, while unknown lines are located with a self-quenching super-regenerative detector. The sensitivity given by the latter system is high. A 50 g sample of potassium chlorate gives a signal-to-noise ratio of 120 at the temperature of liquid air. The multiplet structure caused by the spectrum of the super-regenerator can be seen on the recordings. Nuclear quadrupole resonance (NQR) is a division of radio spectroscopy that has developed relatively recently. The methods of detecting it resemble those used for nuclear magnetic resonance most closely, and so NQR is often called pure quadrupole resonance, in order to make clear that the [illegible]tic field is zero. There are many uses made of

NQR at the present time. Examples are structure studies on crystals, measurement of quadrupole moments, assessment of type and degree of hybridization, and detecting nonequivalent positions in crystal lattices. It is also used in low-temperature studies. A secondary temperature standard has recently been based on NQR, (Ref 1). The apparatus to be described is highly sensitive and distorts the line shapes little. Fig 1 shows the block diagram. The specimen is placed in the coil of a screened autodyne detector, whose frequency is modulated by a low-frequency voltage applied to a PV-1 vibrating capacitor. The 30 c/s filter removes the parasitic amplitude modulation. The NQR is amplified by a three-stage low-frequency amplifier and is fed to a phase-sensitive detector, whose reference voltage is supplied via a phase shifter and amplifier. Wang's circuit (Ref 2), or the circuit shown in Fig 2, is used in the autodyne detector. Wang's circuit reproduces the line shapes well, but it is too insensitive for use in seeking unknown signals in small amounts of material. The system shown in Fig 2 is a normal self-quenching super-regenerator. The self-quenching is controlled by

means of the feed-back resistor in the cathode circuit. The sensitivity is exceptionally high, perhaps higher than ever previously attained. For example, the signal-to-noise ratio given by the 35 Cl in 50 g of potassium chlorate at the temperature of liquid air is 120 (as seen on the oscilloscope). The low-frequency amplifier and autodyne detector are fed from batteries. The phase-sensitive detector is based on Schuster's circuit (Ref 3) in which the high internal impedance of a pentode is used to isolate the output circuit from the switching tube. All tubes were selected for minimum noise. The reference voltage amplifier includes a frequency doubler, because the filter system isolates the second harmonic of the signal. The distortion caused to the signal by the finite amplitude of the frequency modulation is then given by

$$S_2^* = S_o + 1/6\ \nu_m^2 \qquad (1)$$

where S_2^* is the second moment of the absorption line as found by experiment, S_o is the true second moment, and ν_m is the amplitude of the frequency modulation. Thus the second derivative gives even less distortion than

does the first (Ref 4). Fig 4 shows the Cl^{35} signal given by $Sr(ClO_3)_2$ at room temperature. The 30 g specimen was poured directly into a vessel surrounding the coil of the detector. The apparatus can be used to seek and examine unknown lines. The self-quenching super-regenerator is used to locate unknown lines, and Wang's circuit to examine them. The spectra are recorded automatically on an EPP-09 recorder if they are weak; the frequency deviation is made much less than the line width. The clock mechanism varies the frequency at 100-200 kc/s per hour. Time-constants of 10 and 20 sec are usual, but the zero of the phase-sensitive detector is stable with lesser values. The frequency can be varied from 10 to 50 Mc/s by changing the coil; this covers the range in which the quadrupole spectra of Cu and Cl lie. The dispersion and absorption signals are detectable with the super-regenerator. Frequency instability in the detector distorts the line shapes (Refs 5, 6). The resonances from Cl^{35}, Cl^{37}, Cu^{63} and Cu^{65} have been observed for several materials with this system. The Cl^{35} lines in magnesium, calcium, strontium and barium chlorates have been observed for the first time;

Card 4/6

these lie near 29.6 Mc/s at room temperature. It would appear that the crystals are isomorphous. The temperature variations found for the chlorates of divalent metals are about half those found for univalent metals.

In conclusion the author wishes to thank F.I. Skripov for useful advice, and A.P. Vasil'yev for the loan of the vibrating capacitor.

(This is a complete translation.)

Figure captions are as follows. Fig 1, block diagram of the apparatus. a) autodyne detector, frequency-modulated, b) clock mechanism, c) phase shifter, d) reference voltage amplifier, e) phase-sensitive detector, f) rectifier, g) stabilizer, h) quartz oscillator, (units lettered from left to right along lines). Fig 2, the super-regenerator. Fig 3, the phase-sensitive detector. a) reference voltage, b) output, c) input (left to right). Fig 4, the NQR signal from Cl^{35} in $Sr(ClO_3)_2$.

SOV/120-59-2-8/50

Recording Line Shapes in Pure Quadrupole Resonance

There are 4 figures and 6 references, of which 4 are English and 2 Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: March 26, 1958

Card 6/6

24.3400
24.7100
~~26(7)~~

66877
SOV/54-59-4-2/22

AUTHOR: Grechishkin, V. S.

TITLE: An Apparatus Designed for Observing Nuclear Quadrupole Resonance[19] With the Help of Zeeman Modulation

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1959, Nr 4, pp 19-23 (USSR)

ABSTRACT: A quadrupole level in crystals occurs on interaction between the quadrupole momentum of a nucleus and the electrostatic field of the crystal lattice.[1] When the gradient of the electric field exhibits rotation symmetry, the quadrupole level possesses ± M degenerations (M = magnetic quantum number). When applying an outer magnetic field to the crystal, the degenerations vanish which leads to widening of the nuclear quadrupole resonance lines. This fact is employed to observe the phenomenon with the help of Zeeman modulation of the line intensities. An apparatus is described which permits observation of the nuclear quadrupole resonance signal immediately on an oscilloscope screen by means of a nonmonochromatic radiation source and Zeeman modulation. Block diagram of the apparatus and generator are illustrated in figures 1 and 2. The Zeeman modulation is produced by means of a medium-size solenoid with 9,000 windings and a supply device of the ZG-10 type. The best results were ob-

Card ~~1/3~~ 4

An Apparatus Designed for Observing Nuclear Quadrupole Resonance With the Help of Zeeman Modulation

tained at a supply voltage of 40 v and a frequency of 40 cycles. To reduce the effect of the modulation scheme, two T-filters were used. A three-point generator was employed. The conditions of feedback could be chosen in such a manner that the oscillation system screened itself. Furthermore, the supergenerator produces the entire frequency band, which allows to observe the nuclear quadrupole resonance signals immediately without passing through a spectrum. Figure 3 illustrates the signal of nuclear quadrupole resonance which was taken on potassium chlorate with the isotope Cl^{35} at room temperature. By means of the apparatus described the author studied the coupling nature of a number of molecule crystals as well as the hybridization of some chlorine compounds (Table). The absorption frequency was measured by means of a heterodyne wavemeter of the type 121. Investigations have shown that the structure of solids is disclosed by the nuclear quadrupole resonance when using small quantities. In conclusion it is mentioned that the author thanks Professor S. A. Shchukarev and M. A. Oranskaya for supplying the materials, and Docent F. I. Skripov for valuable advice. There are 3 figures, 1 table, and 4 references, 1 of which is Soviet.

21(8) SOV/26-59-8-19/51

AUTHOR: Grechishkin, V.S. (Leningrad)

TITLE: A New Application of Nuclear Resonance

PERIODICAL: Priroda, 1959, Nr 8, p 85 (USSR)

ABSTRACT: Today, the phenomenon of nuclear quadrupole resonance will be greatly utilized to investigate the influence of ionizing radiations on solids, especially to receive information about the character of chemical bonds in the molecules and their arrangement in the crystal lattice. In this article, the author reports on an interesting first experiment made by Soviet scientists, the influence of X-rays on $Ca(ClO_3)_2$. In order to observe the above resonance, a self-quenching superregenerator with a modulated frequency and an amplifier of low frequency with a filter system was utilized. The modulated frequency was accomplished by the sound generator ZG-10. The resonance can be observed on the screen of the oscilloscope (see photograph). The author also reports on former experiments published in the "Zhurnal eksperimental'noy

Card 1/2

SOV/26-59-8-19/51

A New Application of Nuclear Resonance

i teoreticheskoy fiziki" (Journal of Experimental and Theoretical Physics), vol. 36, Nr 2, 1959, p 630. There is 1 photograph and 4 references, 2 of which are French, 1 English and 1 Soviet.

Card 2/2

GRECHISHKIN, V.S.

Effect of apparatus factors on the reproduction of the shape of nuclear quadrupole resonance lines. Vest.LGU 14 no.10:14-19 '59. (MIRA 12:6)

(Crystal lattices)

GRUSHINSKIY, V.S.

Apparatus for the observation of electron cyclotron resonance in a Zeeman modulator. Vest. LGU 17 no.22:119-23 '62. (MIRA 15:11)
(Nuclear resonance)

24(7)
AUTHOR: Grechishkin, V. S.

SOV/56-36-2-51/63

TITLE: The Width of the Lines of the Quadrupole Resonance of Chlorine in the Chlorates of Barium, Sodium, and Potassium (Shirina liniy kvadrupol'nogo resonansa khlora v khloratakh bariya, natriya i kaliya)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 630-632 (USSR)

ABSTRACT: The quadrupole resonance in barium chlorate was detected by the author, but sodium chlorate and potassium chlorate were investigated already in previous papers (Refs 1, 2). Hitherto no precise results and interpretations of the line width of the above-mentioned compounds have been available. A supergenerator with frequency modulation or Zeeman (Zeyeman) modulation, a narrow-band amplifier for low frequencies, and a phase detector were used for observing the resonance. All measurements were carried out at room temperature. The corrections made are discussed in short. The signals of the quadrupole resonance of Cl^{35} and Cl^{37} in powders of $Ba(ClO_3)_2$, $NaClO_3$, and $KClO_3$ were recorded. Recently, the author found

Card 1/3

The Width of the Lines of the Quadrupole Resonance of Chlorine in the Chlorates of Barium, Sodium, and Potassium

a quadrupole resonance also in potassium chlorate. The measured amplitudes of the signals can be explained well by the natural abundance of the chlorine isotopes. The results of the experiments are given in the following table:

Substance	Isotope	frequency megacycles	$\Delta\nu$ cycles	$\Delta\nu\,(Cl^{35})$ / $\Delta\nu\,(Cl^{37})$
$Ba(ClO_3)_2$	Cl^{35}	29.6	2300	1.07
	Cl^{37}	23.2	2600	
$KClO_3$	Cl^{35}	28.1	1100	1.2
	Cl^{37}	22.2	900	
$NaClO_3$	Cl^{35}	29.9	1300	1.13
	Cl^{37}	23.6	1150	

Card 2/3

SOV/56-36-2-51/63

The Width of the Lines of the Quadrupole Resonance of Chlorine in the Chlorates of Barium, Sodium, and Potassium

The line width of the investigated chlorates mainly depends on the dipole-dipole-interaction of nuclei since the ratio of magnetic moments of the chlorine isotopes is equal to 1.2. After making the necessary corrections, the author found d = 6.9 Å for $NaClO_3$ for the dimension of the elementary cell. This result agrees well with the value d = 6.5 Å found by X-ray structure analysis. The author thanks F. I. Skripov for his discussion and for his interest in this paper. There are 1 table and 6 references, 1 of which is Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: November 1, 1958

Card 3/3

21(1), 24(7), 24(2) SOV/53-69-2-2/10

AUTHOR: Grechishkin, V. S.

TITLE: Nuclear Quadrupole Resonance

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 69, Nr 2, pp 189-216 (USSR)

ABSTRACT: The author gives a detailed survey of the principle, the methods, and the possibilities of applying nuclear quadrupole resonance. Many nuclei of the periodic system have quadrupole moments, by the amount of which the extent of the deviation of the nuclear shape from a sphere is characterized. In crystals an orientation of nuclear spins occurs as a result of the interaction between nuclear quadrupoles and the electric field of the molecular electron shells. If a radiofrequency field is applied perpendicular to this direction of orientation, absorption occurs if the radiofrequency is equal to the frequency of the transitions between the levels. This resonance phenomenon is used for the investigation of the crystal structure, determination of the quadrupole moments, investigation of degree and nature of the hybridization of covalent bonds, investigation of rotational oscillations, moments of inertia, etc. It is like-

Card 1/3

wise used in low-temperature engineering. The author also suggested (Ref 101) that they may be used for the stabilization of weak magnetic fields. In the introduction the author discusses several papers dealing with this subject (Landau etc) and gives a rough outline of the theoretical fundamental bases of the occurrence of nuclear quadrupole resonance lines. Chapter 2 deals with the experimental methods of investigating nuclear quadrupole resonance. Figure 2 shows the block scheme of a radiospectroscope used by the author, and figure 3 shows a resonance signal recorded by means of this instrument (barium nitrate at room temperature, 29.6 megacycles). Figure 4 shows the scheme of a self-quenching superregenerator, and figure 5 a signal diagram. Figure 6 shows the scheme of a phase detector according to Schuster, and figure 7 shows a resonance signal obtained by the author (potassium chlorate), which was obtained by employing the Zeeman-modulation method. Further, numerous single results obtained by Western authors are mentioned. Chapter 3 contains details of the shape of nuclear quadrupole resonance-lines and discusses relaxation processes. The reasons for a broadening of lines are discussed (direct magnetic dipole-dipole interaction between nuclei, broadening

in connection with the spin-lattice relaxation time, existence of mechanical tensions in the crystal, the magnetic terrestrial field in the case of polycrystalline samples); the theoretical bases for the calculation of the shape of lines are given. In chapter 4 the temperature- and pressure dependence of quadrupole resonance frequency is discussed, and chapter 5 deals with the occurrence of a Zeeman effect in nuclear quadrupole resonance. These chapters were compiled nearly exclusively from the material obtained from publications by Western authors, as also the application of quadrupole resonance for the investigation of electric field gradients in crystals, which is described in the following chapter. A table gives the values of resonance frequency, line-width, and the signal noise ratio for a number of chlorine- and antimony isotopes in the compounds $p\text{-}C_6H_4Cl_2$, $SbCl_3$, $NaClO_3$, CH_3Cl, $C_2H_2Cl_2$, $SbBr_3$, and Sb_2S_3 for the corresponding temperatures. There are 8 figures, 1 table, and 180 references, 14 of which are Soviet.

24(2)

AUTHORS: Grechishkin, V. S., Skripov, F. I. SOV/20-126-6-21/67

TITLE: The Application of the Quadrupole Nuclear Resonance for the Determination of Frequencies of Lattice Vibrations in the Series of Chlorates (Primeneniye yadernogo kvadrupol'nogo rezonansa dlya opredeleniya chastot reshetochnykh kolebaniy v ryade khloratov)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 6, pp 1229-1231 (USSR)

ABSTRACT: The present paper deals with the investigation of the temperature dependence of the quadrupole nuclear resonance frequency of a series of chlorates with mono- and bivalent metals. As an example, figure 1 shows the nuclear resonance of barium chlorate. Results of the investigation under review are summarized in table 1. In virtue of formula (1), the last column of the table shows the temperature coefficient of vibration at room temperature. It reveals that the temperature coefficient of chlorates of bivalent metals is approximately twice lower than the one relating to chlorates of monovalent metals. The mean frequency of rotational vibration is then computed ($\sim$150 cm^{-1}). By investigating the spectrum of the quadrupole nuclear resonance,

The Application of the Quadrupole Nuclear Resonance for the Determination of Frequencies of Lattice Vibrations in the Series of Chlorates

SOV/20-126-6-21/67

the mean life of the quanta of rotational vibration may be computed. The spin-lattice relaxation time is computed with formula (2) according to H. Bayer (Ref 2). The measurement of the spin-lattice relaxation time in potassium chlorate at room temperature yielded T = 0.04 seconds. After computing the mean life of the quanta of rotational vibration with formula (2), two values were obtained, of which the value $0.5 \cdot 10^{-11}$ seconds was found to be the right one by comparison with the mean life of the quanta of translatory vibration. Finally, the paper deals with the marked dependence of the spin-lattice relaxation in the case of nitrogen nuclei in the crystalline urotropine. There are 1 figure, 1 table, and 15 references, 5 of which are Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

PRESENTED: March 9, 1959, by A. N. Terenin, Academician

SUBMITTED: March 7, 1959

Card 2/2

S/058/61/000/010/053/100
A001/A101

AUTHORS: Grechishkin, V.S., Skripov, F.I.

TITLE: Application of nuclear quadrupole resonance to investigation of the gradient of electric field in several crystals

PERIODICAL: Referativnyy zhurnal.Fizika, no.10, 1961, 165, abstract 10V373 (V sb. "Paramagnitn. rezonans", Kazan', Kazansk. un-t, 1960, 160-162)

TEXT: The authors studied spectra of nuclear quadrupole resonance in some chlorates. On the basis of data obtained, the authors determined average inertia moments of molecules for α-, β- and γ-modifieations of monochloroacetic acid, which turned out to be respectively (in g.cm^2): 130×10^{-40}; 158×10^{-40} and 85×10^{-40}. The times of spin-lattice relaxation for the same modifications, determined as the mean life times of quanta of rotational swinging (at room temperature) are equal (in sec) to: 0.61×10^{-11}; 0.86×10^{-11} and 0.36×10^{-11}. Potential barrier for phase transition in hexachlorane was estimated to equal to 10 kcal. mol^{-1}. Signals of nuclear quadrupole resonance were also observed from solid

Card 1/2

Application of nuclear quadrupole resonance ...

solutions of $SbCl_3$ in KCl and C_6H_6, and shift of nuclear quadrupole resonance frequency was observed in saturated $KClO_3$ solution at liquid oxygen temperature.

N. Pomerantsev

[Abstracter's note: Complete translation]

Card 2/2

S/054/60/000/004/014/015
B004/B056

AUTHORS: Grechishkin, V. S., Ovchinnikov, I. M.

TITLE: Device for Studying Nuclear Quadrupole Resonance in Nitrogen Compounds

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1960, No. 4, pp. 126-129

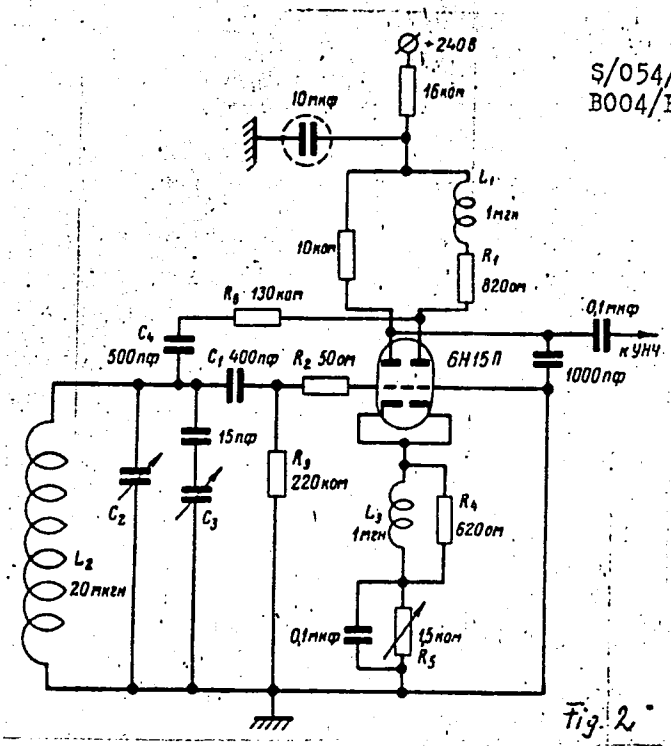
TEXT: A simple device for studying the nuclear quadrupole resonance lines of N^{14} is described. The circuit of the Franklin generator is shown in Fig. 2. The sample is introduced into the well-screened coil L_2 (volume, 2.3 cm^3; inductivity, 20 microhenries). The total capacitance of the circuit at 3.3 Mc/sec is 140 micromicrofarads. The capacitor C_2 serves for the rough adjustment of the generator frequency between 2 - 4 Mc/sec. The rotor of C_3 is driven by a Warren motor (frequency change, 1.5 kc/sec·min). Resonance is studied by means of Zeeman modulation (40 cps). Other parts of the device are a ЗГ-10 (ZG-10) audio-frequency generator, a low-frequency amplifier (1 : 1000) with 6Ж1П (6Zh1P) tubes, a phase detector,

Card 1/3

and an ЭПП-09 (EPP-09) recorder. The resonance of N^{14} in Urotropin was studied at 20°C on 3.3085 Mc/sec. F. I. Skripov, head of the Laboratory of Radiospectroscopy, is thanked for a discussion. There are 3 figures and 8 references: 2 Soviet, 4 US, and 2 Japanese.

Legend to Fig. 2: В = volt; МКФ = microfarad; КОМ = kilohm; МГН = millihenry; ОМ = ohm; УНЧ = to the low-frequency amplifier; пФ = micromicrofarad; 6Н15Л = 6N15L tube; МКГН = microhenry.

S/054/60/000/004/014/015
B004/B056



Card 3/3

Fig. 2.

S/076/60/034/05/18/038
B010/B002

AUTHOR: Grechishkin, V. S.

TITLE: Investigation of Atomic Interaction in Chlorates by the Method of Nuclear Quadrupole Resonance

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 5, pp. 1050-1052

TEXT: The author investigated the change in the quadrupole resonance frequency of some chlorates in which the sheath of the chlorine nucleus remains unchanged and only that atom changes to which the ClO_3^- group is linked. A device having a superregenerator with self-extinction and frequency modulation was designed for this purpose, whereby extremely high sensitivity was attained (Fig.: signal of nuclear quadrupole frequency in barium chlorate). Frequency modulation is performed by means of a special reactive tube. Polycrystalline samples of potassium-, sodium-, and barium chlorate were examined at room temperature. Absorption lines of Cl^{35} were observed at 28.09, 29.93, and 29.59 Mc/s. Investigations of the temperature dependence of nuclear quadrupole frequency showed that the temperature coefficient of barium chlorate is about half as high as that of sodium

Card 1/2

chlorate (about 10^{-4} degrees^{-1}). The shape of the signal of nuclear quadrupole frequency of ClO_3^- permits an explanation of the major part of differences in nuclear frequency of chlorates. The position of the frequencies depends on the differences in the moments of inertia and the oscillation frequencies of the ClO_3^- group (assumed in view of the different temperature coefficients), as well as on the parameters of asymmetry and electronegativity of the metal atom. Finally, the author thanks S. A. Shukarev and M. A. Oranskaya (deceased) for supplying the substances under consideration. Markovnikov is also mentioned in this paper. There are 1 figure and 5 references, 1 of which is Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: July 16, 1958

30465
S/139/61/000/005/001/014
E132/E135

24.7100 (1153, 1144, 1142)

AUTHOR: Grechishkin, V.S.

TITLE: Determination of the magnitudes of the mean lives of quanta of rotational vibrations in certain crystals from the data for purely quadrupole resonance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, no.5, 1961, 11-14

TEXT: The method of nuclear quadrupole resonance (n.q.r.) has been applied for estimating the order of magnitude of the mean life times of quanta of rotational vibrations in certain crystals. Resonances in the isotopes of Cl, Br and N have been observed. The contribution to the line width in the spectra of combination scattering of the finite life of the rotational-vibrational state has been estimated. Comparison with experimental observations of the line widths in the spectrum of combination scattering at low frequencies showed that the contribution to the width due to the mechanism considered amounts to 5-10% of the total width. This shows that the method of n.q.r. is applicable for estimating the order of magnitude of the life time although this fails if there

Card 1/2

is strong line widening by the apparatus, impurities or anharmonicities, etc. The magnitude of the life found is reasonable as it is similar to what is found for phonons (quanta of translational oscillations). Hitherto life calculations have been almost impossible because of inadequacies in non-linear lattice theory. It is shown that each molecule makes about 100-200 oscillations in each excited state. The decay of rotational oscillations is not connected with the presence of impurities since these waves do not spread through the lattice. The life time is probably conditioned by the potential of the intermolecular forces.

There are 1 table and 11 references: 7 Soviet and 4 non-Soviet. The two English language references read as follows:

Ref.1: T.P. Das, E.L. Hann. Solid State Physics, Suppl. 1, No.5, 1958.

Ref.8: N. Bloembergen, E.M. Purcell, R.V. Pound. Phys. Rev., Vol.73, 679, 1948.

ASSOCIATION: Permskiy gosuniversitet imeni A.M. Gor'kogo (Perm State University imeni A.M. Gor'kiy)

SUBMITTED: October 24, 1960

GRECHISHKIN, V.S.

Calculating the constants of quadrupole bonds in some homonuclear diatomic molecules of halides. Izv.vys.ucheb.zav.; fiz. no.5:23-25 '61. (MIRA 14:10)

1. Permskiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
(Halides) (Chemical bonds)

2:0h1

S/181/61/003/004/007/030
B102/B214

24.6520 (1160, 1155, 1163)

AUTHOR: Grechishkin, V. S.

TITLE: Nuclear spin-lattice relaxation for the spin 1 or 5/2

PERIODICAL: Fizika tverdogo tela, v. 3, no. 4, 1961, 1066-1067

TEXT: The present paper gives a generalization of a formula of H. Bayer (Zs. f. Physik, 130, 227, 1951) for the spins 1 and 5/2. Bayer has developed a theory of spin-lattice relaxation in nuclear quadrupole resonance for the spin 3/2, which gives a satisfactory description of the temperature dependence of the relaxation time T_1. Since T_1 depends on the mean lifetime of a rotation-vibration quantum, an estimate of τ_a can be made from an accurate measurement of T_1. Analogous estimates can also be made for the nitrogen (spin 1) or iodine (spin 5/2) nucleus. No data are, however, available in the literature for these important cases; they are provided in the present paper. Spin 1: At moderately low temperatures, the relaxation mechanism is determined essentially

Card 1/5

by the transitions with $|\Delta m| = 2$, the contribution of transitions with $|\Delta m| = 1$ being negligible. For this the Hamiltonian is:

$$\mathcal{H}_{+2} = \frac{3}{16}\frac{eQq_{zz}\theta^2(t)}{J(2J-1)}(I_+^2 + I_-^2), \qquad (1) \qquad (1),$$

where eQq_{zz} is the quadrupole binding in frequency units, $\theta(t)$ the angle between the symmetry axis and the electric field strength, J the spin of the resonating nuclei; $I_{\pm} = I_x + iI_y$ are the operators of the nuclear-spin projection. If $J = 1$, one obtains after some transformations $\mathcal{H}_{+2} = -\frac{h\nu_Q}{4}\theta^2(t)(I_+^2 + I_-^2)$, where ν_Q is the nuclear quadrupole resonance frequency. From this one obtains for the transition probability:

$$W_{+2} = \frac{|V_{+2}|^2}{h^2} J_2(\nu), \qquad (3) \qquad (3),$$

$$V_{+2} = \frac{1}{8} h\nu_Q [I_+^2 + I_-^2]_{1,-1}; \quad J_2(\nu) = \int_{-\infty}^{\infty} K(\tau) e^{2\pi i\nu\tau} d\tau,$$

Card 2/5

Nuclear spin-lattice ...

where $K(\tau)$ is the correlation function. If only the rotation vibrations are considered, the spectrum of the correlation function is given by

$$J_2(\nu)=\frac{1}{2\pi^4}\frac{\hbar^2\tau_a}{J_1^2\nu_t^2}\frac{\frac{2(\mathrm{ch}\,x-1)}{1+4\pi^2\nu^2\tau_a^2(e^x-1)^2}+\frac{2\,\mathrm{ch}\,x-1}{1+4\pi^2\tau_a^2\nu^2}}{(e^x-1)^2}, \qquad (4) \quad (4),$$

where J_1 is the moment of inertia of the molecule, ν_t the rotation-vibration frequency of the molecule, $x = h\nu_t/kT$. When the nuclear spin changes, the form of the matrix elements V_{+2} does not remain constant. These elements can be calculated with the help of the known wave functions. With (3) and (4) one obtains

$$T_{1\,|\Delta m|=2}=\frac{1}{2W_{+2}}=\frac{4(\pi J_1\nu_t)^2}{(h\nu_0)^2\tau_a}\frac{(e^x-1)^2}{\frac{2(\mathrm{ch}\,x-1)}{1+\omega^2\tau_a^2(e^x-1)^2}+\frac{2\,\mathrm{ch}\,x-1}{1+\omega^2\tau_a^2}}. \qquad (5) \quad (5).$$

A comparison of this formula with that of Bayer shows that only a numerical factor is altered. Spin 5/2: In this case, two transition

Card 3/5

Nuclear spin-lattice ...

frequencies are to be observed: $\nu_1 = \frac{3}{10} eQq_{zz}$ and $\nu_2 = \frac{3}{20} eQq_{zz}$. These transitions must have different relaxation times. By a treatment analogous to that given above one obtains

$$\left.\begin{aligned} T_{1|\Delta m|=2}(\nu_1) &= \frac{64}{10}\frac{(\pi f_1 \nu_1)^2}{(h\nu_{Q_1})^2\tau_a}\,\frac{(e^x-1)^2}{\dfrac{2(\operatorname{ch}x-1)}{1+\omega_1^2\tau_a^2(e^x-1)^2}+\dfrac{2\operatorname{ch}x-1}{1+\omega_1^2\tau_a^2}}, \\ T_{1|\Delta m|=2}(\nu_2) &= \frac{8}{9}\frac{(\pi f_1 \nu_1)^2}{(h\nu_{Q_1})^2\tau_a}\,\frac{(e^x-1)^2}{\dfrac{2(\operatorname{ch}x-1)}{1+\omega_2^2\tau_a^2(e^x-1)^2}+\dfrac{2\operatorname{ch}x-1}{1+\omega_2^2\tau_a^2}}. \end{aligned}\right\} \quad (7). \qquad (7).$$

This formula can be used for the calculation of a "molecule generator" or for the estimation of the extremum of τ_a from known T_1. In some cases, the assumptions used by Bayer for the calculation of the correlation function are not fulfilled; thus, for example, the assumption that all excited states have the same lifetime, and that a transition of one state into another always takes place with a preceding return to the ground state. This, for example, is not fulfilled in the case of Urotropin.

Card 4/5

In a number of other cases, a good agreement with the experiment is obtained. At present, a more exact theory still offers great difficulties. The author thanks F. I. Skripov for discussions. [Abstracter's note: Essentially complete translation.] There are 2 references: 1 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: June 9, 1960

GRECHISHKIN, V.S.; AYNBINDER, N.Ye.

Quadrupole effects in the nuclear resonance spectrum of urea and sodium thiosulfate single crystals. Fiz. tver. tela 3 no.6:1821-1826 Je '61. (MIRA 14:7)

1. Permskiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Electric moments) (Sodium thiosulfate crystals--Spectra)
(Urea crystals--Spectra)

GRECHISHKIN, V.S.; SVETLOV, Yu.G.; SOYFER, G.B.

Variation of the multiplet nature of the spectrum of quadrupole nuclear resonance in solid CCl_4. Fiz. tver. tela 3 no.8:2390-2393 Ag '61. (MIRA 14:8)

1. Permskiy gosudarstvennyy universitet im. A.M. Gor'kogo.
(Carbon tetrachloride)
(Nuclear magnetic resonance and relaxation)

GRECHISHKIN, V.S.; SOYFER, G.B.

Investigating orientational melting in certain crystals by the nuclear quadrupole resonance method. Fiz. tver. tela 3 no.9:2791-2793 S '61. (MIRA 14:9)

1. Permskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
(Crystals--Thermal properties)
(Nuclear magnetic resonance and relaxation)

SUKHOV, V.N., inzh.; GRECHISHKIN, V.S., inzh.

Field trial of the A-2 mining unit. Ugol'.prom. no.4:21-23 Jl-Ag '62. (MIRA 15:8)

1. Trest "Krasnoluchugol'".
(Coal mining machinery--Testing)

S/181/61/003/010/011/036
B111/B138

AUTHORS: Grechishkin, V. S., and Aynbinder, N. Ye.

TITLE: Relative intensities of nuclear resonance lines in single crystals in the presence of magnetic and quadrupole interactions

PERIODICAL: Fizika tverdogo tela, v. 3, no. 10, 1961, 2981 - 2986

TEXT: The present paper is a continuation of Ref. 1(V. S. Grechishkin, N. Ye. Aynbinder, FTT, 3, no. 6, 1821, 1961), where formulas had been given for the energy levels of nuclear resonance in the case of quadrupole interaction (nuclear spin $J = 1$ and $J = 3/2$). For these spins, formulas are now derived for the relative integral intensities of the absorption lines. The external magnetic field is along the principal axis z of the gradient tensor of the crystal's electric field. The method of calculation has been provided by L. S. Mayants (Ref. 3: Teoriya i raschet kolebaniy molekul. Izd. AN SSSR, M., 1960). The power absorbed by the specimen is proportional to $A^2\sin^2\theta_1\sin^2\varphi_1 + (B\sin\theta_1\cos\varphi_1 + C\cos\theta_1)^2$ (3).

1st case: $J = 1$. If $\theta = 0$ and $\varphi = 0$, $\theta_1 = \pi/2$, $\varphi_1 = 0$ (θ being the angle

Card 1/4

between magnetic field and z-axis, and φ being the azimuthal angle), the following relations are obtained employing (3):

$$\left.\begin{aligned} B^2_{3,1} &= \frac{1}{2} + \frac{\eta}{2\sqrt{R^2+\eta^2}}; \\ B^2_{3,\frac{1}{2}} &= \frac{1}{2} - \frac{\eta}{2\sqrt{R^2+\eta^2}}. \end{aligned}\right\} \qquad (10)$$

The subscripts indicate the transitions (e. g., $B_{3,1} : \lambda_3 \rightarrow \lambda_1$), η is the parameter of asymmetry, $R = \frac{4\mu H_0}{eQq_{zz}}$, eQq_{zz} is the constant of the quadrupole bond, and μ is the nuclear magnetic moment. Hence, the power absorbed is only proportional to B^2. (10) is valid only if the r-f coil axis is directed along the x-axis. If it is directed along y, only the term with A^2 will remain nonvanishing in (3), and the following relations will be satisfied:

Card 2/4

Relative intensities of nuclear...

$$\left.\begin{aligned} A^2_{3,1} &= \frac{1}{2} - \frac{\eta}{2\sqrt{R^2+\eta^2}}; \\ A^2_{3,2} &= \frac{1}{2} + \frac{\eta}{2\sqrt{R^2+\eta^2}}; \\ A^2_{2,1} &= \frac{\eta}{R^2+\eta^2}. \end{aligned}\right\} \qquad (11).$$

Hence, if $\theta = \pi/2$ and $\varphi = 0$, the r-f coil axis will be directed along the x-axis, and the following will be valid: $B^2_{2,1} = \frac{(3+\eta)^2}{(3+\eta)^2 + 4R^2}$; $B_{3,2} = B_{3,1} = 0$. The position of the principal axes of the gradient tensor of the crystal's electric field may be determined from the spectra with different crystal positions. 2nd case: $J = 3/2$, is treated in a similar way. Formulas obtained are valid with the exception of the intersection points of the energy levels. If the r-f coil axis is directed along x, the transitions $\lambda_1 \rightarrow \lambda_2$ and $\lambda_3 \rightarrow \lambda_4$ will be forbidden. In general, all of the six possible transitions can be excited near the level intersection points by a rotation of the r-f coil. But some of them, and one at least, are

Card 3/4

too weak to allow experimental detection. It has been found that the spectrum multiplicity may be determined from the number of energy levels, from the level intersection points, from the superposition of wave functions, and from the position of the r-f coil axis with respect to the principal axes of the gradient tensor of the crystal's electric field. V. M. Zaytsev is thanked for a discussion. There are 1 figure and 3 references: 2 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: M. Bloom et al., Canad. J. Phys. 36, 1286, 1958.

ASSOCIATION: Permskiy gosudarstvennyy universitet im. A. M. Gor'kogo (Perm' State University imeni A. M. Gor'kiy)

SUBMITTED: May 3, 1961

GRECHISHKIN, V.S.

Nuclear quadrupole resonance study of the elctrical field gradient in crystals. Zhur.fiz.khim. 35 no.8:1803-1807 Ag '61. (MIRA 14:8)

1. Leningradskiy gosudarstvennyy universitet imeni A.A. Zhdanova.
(Crystals--Electric properties)

36963
S/141/62/005/001/009/024
E039/E135

24.7500

AUTHORS: Grechishkin, V.S., and Kyuntsel', I.A.

TITLE: Line form distortions of the nuclear quadrupole resonance caused by apparatus factors

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.5, no.1, 1962, 95-103

TEXT: The investigation of the shape of nuclear quadrupole resonance lines is of interest in the study of the structure and dynamics of the crystal lattice. Calculations on the influence of apparatus factors on reproduced shapes of lines are therefore of practical value. In this paper is examined the question of the optimum conditions for recording derived absorption signals. Calculations are also made on the influence of the time constant of the phase detector on recording different derivatives. The behaviour of the coefficients of the first three harmonics in a nuclear quadrupole resonance signal is calculated both for the Gaussian and Lorentzian form of lines. The results of these calculations are given graphically. It is shown that, in both

the Gaussian and Lorentzian cases, at the frequency modulation with a 40% correction, it is essential to record the third derivative of the signal. This results in an improved signal-to-noise ratio. It is of interest to note that in the case of p - $C_6H_4Cl_2$ for the transition from the α to the β modification at 47.8 °C there is a gradual change in the form of the absorption line from a Lorentzian form to one intermediate between Lorentzian and Gaussian. The circuit diagram of the spectrometer is illustrated and briefly described. The experimental results closely follow the theoretical predictions. It is also shown that the time constant of the phase detector influences the position of the centre line of the recorded signals of different derivatives.
There are 7 figures and 1 table.
ASSOCIATION: Permskiy gosudarstvennyy universitet
(Perm State University)
SUBMITTED: May 22, 1961

Card 2/2

S/181/62/004/008/033/041
B108/B102

AUTHORS: Grechishkin, V. S., and Soyfer, G. B.

TITLE: Change in the multiplet structure of the nuclear resonance spectrum in chloral alcoholate crystals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 8, 1962, 2268 - 2269

TEXT: The temperature dependence of the nuclear quadrupole resonance of Cl^{35} in $CCl_3C(OH)_2C_2H_5$ was investigated in the interval 77 - 320°K. The techniques are described in earlier publications (FTT, 3, 2390, 2791, 1961). The spectrum which was observed up to 39°C shows an abnormal behavior. The lines ν_1 and ν_2 have nearly the same temperature coefficients, line ν_3 has a considerably greater coefficient. At about 12°C the triplet turns into a doublet. This behavior is attributed to a change in the interatomic distances in the molecule. Piezoelectric resonance signals were observed which are proof of piezoelectric properties of chloral alcoholate. The proton resonance signal at room temperature in a field of

Card 1/2

S/181/62/004/008/033/041
B108/B102

Change in the multiplet ...

5000 oe has a fine structure. This is possibly related to a retarded rotation of the methyl groups. There is 1 figure.

ASSOCIATION: Permskiy gosudarstvennyy universitet im. A. M. Gor'kogo (Perm' State University imeni A. M. Gor'kiy)

SUBMITTED: April 21, 1962

Card 2/2

S/181/62/004/010/061/063
B102/B104

AUTHORS: Grechishkin, V. S., Zlatogorskiy, M. L., and Osipenko, A. N.

TITLE: Magnetic screening of the Na^{23} nucleus in alkali-halide crystals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 10, 1962, 2987 - 2989

TEXT: The magnetic screening of the Na^{23} nucleus, not hitherto investigated, was now studied by measuring the chemical shift of the nuclear magnetic resonance signal. The measurements were made in a uniform magnetic field of 5.8 koe (instability 10^{-5}/hr, nonuniformity $10^{-6}/cm^3$), the n.m.r. signals were observed at 6.5 Mc. The following values for the magnetic screening σ were obtained: $\sigma_{exp} \cdot 10^4 = -(0.21 \pm 0.05)$, $-(0.27 \pm 0.07)$, $-(0.41 \pm 0.10)$, $-(0.42 \pm 0.12)$ for Na^{23} in NaF, NaCl, NaBr, and NaI respectively. For NaCl, σ was calculated on the basis of the Kondo-Yamashita model (J. Phys. Chem. Solids, 10, 245, 1959) and the value of $-0.36 \cdot 10^{-4}$ obtained is in good agreement with experiment. Also the mean excitation energies of the outer np electrons were calculated

Card 1/2

and 10.6, 7.8, 6.6 and 5.4 ev were obtained for NaF, NaCl, NaBr and NaI. The components S_p of the overlapping integral ($S^2 = S_s^2 + S_p^2$) were 0.045, 0.049, 0.048 and 0.044 for the above crystals. There are 1 figure and 1 table.

ASSOCIATION: Permskiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Perm' State University imeni A. M. Gor'kiy)

SUBMITTED: June 19, 1962

S/141/62/005/003/005/011
E032/E514

AUTHORS: Grechishkin, V.S. and Soyfer, G.B.

TITLE: Influence of crystal lattice defects on the intensity and form of nuclear quadrupole resonance lines of crystals

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.5, no.3, 1962, 508-515

TEXT: The spectrometer described in previous papers (Ref.6: PTE, 2, 31, 1959; Ref.7: Vestnik LGU, 10, 14, 1959) was used in the observation of the nuclear quadrupole resonance. A simple self-quenched super-regenerator was developed for the detection of Br resonances (200-300 Mc/sec); it is shown in Fig.1. A study was made of Co^{60} γ-rays and X-rays (40 kV tube) on the intensity and width of NQR lines of the following crystals: $KClO_3$, $NaClO_3$, $Mg(ClO_3)_2$, $Ca(ClO_3)_2$, $Sr(ClO_3)_2$, $n\text{-}C_6H_4Cl_2$, $CCl_3COH \cdot H_2O$ and C_2Cl_6. Doses of 150 000 r and 300 000 r (Co^{60} γ-rays) were given and the intensity and width of the lines determined. This was repeated with X-rays (except for the last two crystals). It was found that the experimental errors are very

dependent on the uniformity and illumination of the specimens and the working conditions of the super-regenerator. When plotted as a function of time, the line intensity and width decreased with duration of irradiation. When the measurements were repeated after an interval of the order of ten days, a partial restoration of the signal was observed. Measurements were also made of the intensity of NQR lines of Br^{81} in n-$C_6H_4Br_2$ as a function of the concentration of the following impurities: n-$C_6H_4Cl_2$, m-$C_6H_4(NO_2)_2$, C_6Cl_6 and $C_6H_5N = NNHC_6H_5$. Of these four impurities the first had the largest and the last the smallest effect on the line intensity. The experiments were repeated with single crystals of n-$C_6H_4Br_2$. The general conclusion is that NQR studies can provide quantitative data on crystal defects, provided a calibrated spectrometer is employed and particular care is taken in the preparation of specimens. However, the accuracy of the results is not altogether satisfactory in view of the inadequate stability of the apparatus and the time necessary to complete the measurements. The super-regenerator must be continuously calibrated. There are

Influence of crystal lattice ... S/141/62/005/003/005/011
E032/E514

4 figures and 1 table.

ASSOCIATION: Permskiy gosudarstvennyy universitet
(Perm State University)

SUBMITTED: October 23, 1961

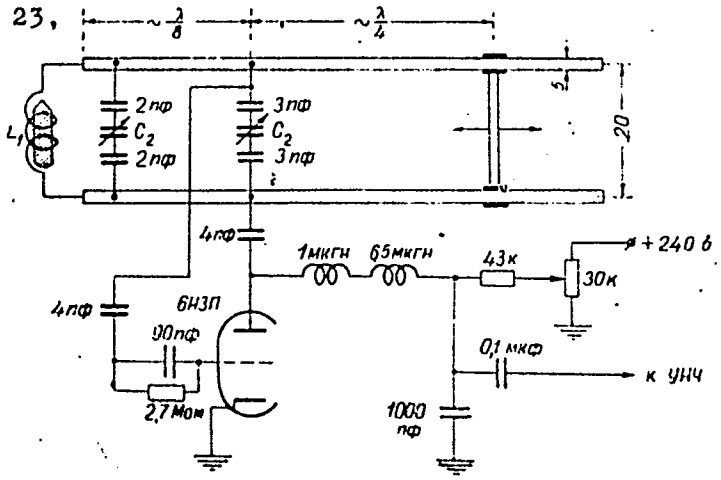


Fig.1

Card 3/3

45625

S/141/62/005/006/009/023
E032/E414

24.7900

AUTHORS: Aynbinder, N.Ye., Grechishkin, V.S.

TITLE: Energy levels and relative line intensities in the case of nuclear spin resonance in single crystals

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika, v.5, no.6, 1962, 1123-1129

TEXT: One of the ways of approaching this problem is to determine the resonance frequencies experimentally for an arbitrary orientation of the crystal and estimate the polar angles of the external magnetic field relative to the principal axes of the crystal, and then adjust the crystal until the required direction of the external field relative to the crystal is achieved. A calculation was therefore carried out of the nuclear spin resonance energy levels in the case of $J = 3/2$ and small departures (of the order of 10°) of the direction of $\underline{H}_0$ from each of the principal axes of the electric field gradient tensor of the crystal. The specific substance taken for this calculation was $Na_2S_2O_3 \cdot 5H_2O$. The method of zero-splitting cone (C.Dean, Phys. Rev. v.96, 1954, 1053) is employed and extended to the case of an

Card 1/2

arbitrary magnitude of the external magnetic field. Expressions are obtained for the "mirror" energy levels and the associated transition intensities in the special case $\eta = 0$, where η is the asymmetry parameter. The zero-splitting parameters α, β and γ are tabulated for spin $J = 7/2$. The theoretical calculations have also been compared with experimental data for Sb^{123} ($J = 7/2$) in a single crystal of $SbCl_3$. The transitions $\pm 1/2$ to $\pm 3/2$ and $\pm 3/2$ to $\pm 5/2$ have been observed leading to an asymmetry parameter $\eta = 16\%$. Calculated values for the polar angles of $\underline{H}_0$ in the principal-axes system were found to be in agreement with experimental values. There are 3 figures and 1 table.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm State University)

SUBMITTED: May 24, 1962

Card 2/2

GRECHISHKIN, V.P.

Watch type "SK" tachometer. Tekst.prom. 22 no.10:77 O '62. (MIRA 15:11)

1. Glavnyy spetsialist Gosudarstvennogo komiteta Soveta Ministrov RSFSR po koordinatsii nauchno-issledovatel'skikh rabot.
(Textile industry--Equipment and supplies)
(Tachometer)

43367
S/056/62/043/005/024/058
B102/B104

24.7900

AUTHORS: Grechishkin, V. S., Kyuntsel', I. A.

TITLE: Relative intensities of nuclear quadrupole resonance lines of Sb^{121} in antimony trichloride

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1712 - 1713 .

TEXT: The nuclear quadrupole resonances of Sb^{121} in $SbCl_3$ crystals are calculated for the transitions between the levels 1 ($m = \pm 1/2$), 2 ($m = \pm 3/2$) and 3 ($m = \pm 5/2$): $\nu(\pm 1/2 \rightarrow \pm 3/2)$, $\nu(\pm 3/2 \rightarrow \pm 5/2)$, and $\nu(\pm 1/2 \rightarrow \pm 5/2)$. The latter is a "forbidden" one (Z. Phys. 130, 385, 1951). Each of the states is twofold degenerate. $eQq_{zz} = 376.902$ Mc for Sb^{121} in $SbCl_3$, Q being the nuclear quadrupole moment and q_{zz} the tensor component of the electric field gradient of the lattice. For polycrystalline $SbCl_3$ the probability ratio of the three transitions is $W^2_{1,2} : W^2_{2,3} : W^2_{1,3} = 1 : 0.59 : 0.0058$. At

Card 1/2

Relative intensities of...

room temperature $\nu_{1,2}$ was observed to be 58.156 Mc with an oscilloscope signal-to-noise ratio of $\sim$3. At +18.6°C $\nu_{2,3}$ was 112.596 Mc with a signal-to-noise ratio of 1.6. The ratio $W_{1,2}:W_{2,3} = 1 : 0.54$, which agrees well with the theoretical ratio. Because of its low intensity, the $\nu_{1,3}$ transition cannot be observed in the 170 Mc spectrum. Therefore an indirect method was applied. The frequency of the transition was determined from the temperature dependence of the resonance signals measured. A 20-w generator for the 170 Mc band was constructed. When a saturating field of $\approx$170.5 Mc was applied, a reduction of the $\nu_{1,2}$ intensity by a factor of 0.83 could be observed. In this case the "forbidden" transition is saturated and the difference in population between the levels 1 and 2 is reduced. There are 2 tables.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm' State University)

SUBMITTED: April 30, 1962

Card 2/2

GRECHISHKIN, V.S.

Progress of radio spectroscopy. Priroda 51 no.5:20-24 My '62.
(MIRA 15:5)

1. Permskiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Microwave spectroscopy)

L 17072-63 EWT(1)/EWP(q)/EWT(m)/BDS S/192/63/004/002/002/002
AFFTC/ASD JD

58

AUTHOR: Grechishkin, V. S. and Kyuntsel', I. A.

TITLE: Nuclear quadrupolar resonance of antimony isotopes in monocrystals of $SbCl_3$, $2SbCl_3 \cdot C_6H_6$, and $2SbCl_3 \cdot C_7H_8$

PERIODICAL: Zhurnal strukturnoy khimii, v. 4, no. 2, 1963, 269-271

TEXT: Inasmuch as there are different spins for Sb^{121} and Sb^{123}, it was indicated that it should be possible to observe several transitions in the nuclear quadrupolar resonance of these isotopes and that it should also be possible to determine the parameter of asymmetry η from a measurement of the frequencies of these transitions. A study was therefore made of the nuclear quadrupolar resonance of the antimony isotopes in monocrystals of $SbCl_3$, $2SbCl_3 \cdot C_6H_6$, and $2SbCl_3 \cdot C_7H_8$. In the latter two samples nuclear quadrupolar resonance was determined for the first time. There are 4 figures and 3 formulas.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm State University)

SUBMITTED: May 19, 1962

Card 1/1

S/181/63/005/003/038/046
B102/B180

AUTHORS: Grechishkin, V. S., and Kyuntsel', I. A.

TITLE: Temperature dependence of the nuclear quadrupole resonance frequency of Sb^{121} in some single crystals

PERIODICAL: Fizika tverdogo tela, v. 5, no. 3, 1963, 948-949

TEXT: To produce the quadrupole temperature standards needed for high-accuracy measurements ($\pm 0.002^{\circ}K$) it is very important to find crystals with a high temperature coefficient of nuclear quadrupole resonance. The authors measured $\nu(T)$ the temperature dependences of the Sb^{121} resonance frequencies, between 77 and $340^{\circ}K$ for four monocrystalline samples: $SbCl_3$ (1), $2SbCl_3C_6H_6$ (2), $SbCl_3C_6H_5C_2H_5$ (3) and $2SbCl_3C_6H_5C_6H_5$ (4). All the crystals were grown by the Bridgman method. The results (Fig.) show that some of the $SbCl_3$-compounds have an abnormally high temperature coefficient, always higher than (1), except for (4) which undergoes a

phase transition due to which the coefficient drops from 11 to 4.5 kcs/deg The coefficient of (1) is 5 kcs/deg, of (2) 11 kcs/deg, and of (3) it is highest: 17kc/deg. With (4) piezoelectric resonances were also observed and a proton resonance was observed with all crystals. (3) holds out promise for the production of temperature standards. There is 1 figure.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm State University)

SUBMITTED: November 12, 1962

Temperature dependence of the nuclear ...

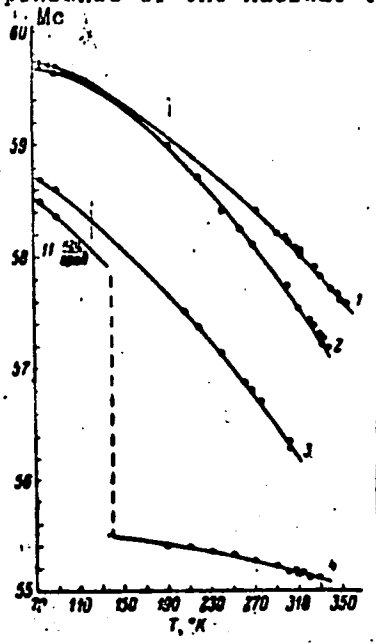


Fig.

Card 3/3

S/141/63/006/001/003/018
E140/E435

AUTHORS: Grechishkin, V.S., Zlatogorskiy, M.L., Svetlov, Yu.G.

TITLE: Apparatus for observing broad nuclear magnetic resonance lines

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika, v.6, no.1, 1963, 36-41

TEXT: In the study of nuclear magnetic resonance in solid bodies the lines are very broad because of magnetic dipole-dipole and quadripole electric interactions. The stability requirements on the apparatus are less than for the observation of proton chemical shifts but the sensitivity required is much higher, since signal absorption in solid bodies is less than in liquids. A wide range of frequencies is also required if a large number of different nuclei are to be measured. Further, the field intensities required vary widely as a function of the spin relaxation times. The article describes an electronic (vacuum tube) instrument for measurements on H^1, H^2, Li^7, F^{19}, Na^{23}, Al^{27}, Br^{81}, B^{11}. The radio frequency can be varied from 3 to 22 Mcs, the magnetic field from 50 to 7000 Oe. Examples of curves taken in various plastics and single crystals are given. A radio-electronic device with

Apparatus for observing ...

crossed coils has been incorporated into the spectrometer. Combined with a narrow-band receiver this enabled increasing the sensitivity of the equipment over the frequency range 1 to 4 Mcs. The coupling between the receiving and transmitting coils was reduced to 80 db. There are 7 figures.

ASSOCIATION: Permskiy gosudarstvennyy universitet
(Perm State University)

SUBMITTED: June 2, 1962

Card 2/2

S/120/63/000/001/018/072
E039/E320

AUTHORS: Grechishkin, V.S. and Soyfer, G.B.

TITLE: An autodyne circuit for observing nuclear quadrupole resonance of isotopes of bromine and iodine

PERIODICAL: Pribory i tekhnika eksperimenta, no. 1, 1963, 87 - 88

TEXT: This is a description of an improved two-stage autodyne circuit with twice the power output and twice the signal/noise ratio of a similar circuit described by Schawlow (J. Chem. Phys., 1954, 22, 1211). The use of a two-stage circuit reduces the effect of interelectrode capacity and enables higher frequencies to be obtained. It is suitable for making nuclear quadrupole resonance (NQR) measurements in the range of frequency from 140 to 300 Mc/s. The sample (volume 0.4 cm^3) is placed in a coil at the end of the grid Lecher and oscillations are obtained when the length of the grid Lecher is less than $\lambda/4$ and the length of the cathode Lecher more than $\lambda/4$. The autodyne output is fed into a 6Zh1P (6Zh1P) low-frequency amplifier and presented on an oscilloscope and recorder. The super-regenerative circuit is described briefly and the results of NQR measurements on Br^{81} and I^{127} are shown.

Card 1/2

An autodyne circuit for ....

The samples used were a single crystal of n-$C_6H_4Br_2$ (ν_o = 223.756 Mc/s at +18.7 °C) and SnI_4 (ν_o = 203.844 Mc/s at +20.5 °C). A signal/noise ratio of ~170 was obtained. The circuit has been used for a long time and its reliability and simplicity of tuning have been demonstrated. While this circuit could be used for frequencies greater than 300 Mc/s, this possibility has not been exploited in the present work. There are 4 figures.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm State University)

SUBMITTED: April 10, 1962

Card 2/2

AYNBINDER, N.Ye.; GRECHISHIN, V.S

Nuclear resonance energy levels in single crystals in the presence of magnetic and quadrupole interactions. Izv. vys. ucheb. zav.; fiz. no.5:27-31 '63. (MIRA 16:12)

1. Permskiy gosudarstvennyy universitet imeni A.M.Gor'kogo.

GRECHISHKIN, V.S.; SOYFER, G.B.; SVETLOV, Yu.G.

Use of the nuclear quadrupole resonance method in studying phase transitions in certain crystals. Izv. vys. ucheb. zav.; fiz. no.5: 32-38 '63. (MIRA 16:12)

1. Permskiy gosudarstvennyy universitet imeni A.M.Gor'kogo.

ACCESSION NR: AP4009475 S/0051/63/015/006/0832/0833

AUTHOR: Grechishkin, V.S.; Kyuntsel', I.A.

TITLE: Frequencies of nuclear quadrupole resonance of Br^{79} and Br^{81} in Menshutkin complexes

SOURCE: Optika i spektroskopiya, v.15, no.6, 1963, 832-833

TOPIC TAGS: nuclear quadrupole resonance, NQR, bromine organic complexes, Br^{79}, Br^{81}, antimony bromide complex, benzene derivative, benzene complex

ABSTRACT: Complexes of antimony bromide ($SbBr_3$) with derivatives of benzene and naphthalene, which were first described by B.N.Menshutkin in 1912, exhibit a number of interesting properties. At present there is enhanced interest in molecular complexes in connection with search for organic semiconductors. In the present study there was investigated nuclear quadrupole resonance of Br^{79} and Br^{81} in a number of molecular complexes with $SbBr_3$. For the most part these were complexes with benzene and benzene derivatives. The nuclear quadrupole resonance was observed by means of a superregenerator with external damping (V.S.Grechishkin and G.B.Soyfer, PTE, No.1,87,1963). The spectra were displayed on an oscilloscope

Card 1/2

AP4009475

screen and the absorption frequencies were measured by a heterodyne wavemeter. The results obtained at room temperature are tabulated. For most of the complexes there are observed three NQR lines of Br^{79} and Br^{81}. The NQR frequency is proportional to the number of unpaired p electrons. Orig.art.has: 1 table.

ASSOCIATION: none

SUBMITTED: 29Apr63 DATE ACQ: 03Jan64 ENCL: 00

SUB CODE: PH,CH NR REF SOV: 004 OTHER: 001

Card 2/2

GRECHISHKIN, V.S.; SOYFER, G.B.

Change of the multiplet nature of the nuclear quadrupole resonance spectrum in crystals of octachloronaphthalene. Zhur.strukt.khim. 4 no.5:763-764 S-O '63. (MIRA 16:11)

1. Permskiy gosudarstvennyy universitet imeni Gor'kogo.

GRECHISHKIN, V.S.; AYNBINDER, N.Ye.

Quadrupole energy levels for certain spins. Izv. vys. ucheb. zav.; radiofiz. 6 no.4:729-737 '63. (MIRA 16:12)

1. Permskiy gosudarstvennyy universitet.

GRECHISHKIN, V.S.; KYUNTSEL', I.A.

Nuclear quadrupole resonance frequencies of Br^{79} and Br^{81} in Menshutkin complexes. Opt. i spektr. 15 no.6:832-833 D '63. (MIRA 17:1)

GRECHISHKIN, V.S.; KYUNTSEL', I.A.; SOYFER, G.B.

Use of nuclear quadrupole resonance for physicochemical analysis.
Zav.lab. 29 no.11:1310-1315 '63. (MIRA 16:12)

1. Permskiy gosudarstvennyy universitet.

GRECHISHKIN, V.S.; AYNBINDER, N.Ye.

Nuclear spin resonance. Usp. fiz. nauk 80 no.4:597-637 Ag '63. (MIRA 16:9)

ACCESSION NR: AP4018356 S/0120/64/000/001/0005/0022

AUTHOR: Grechishkin, V. S.; Soyfer, G. B.

TITLE: Apparatus for observation of the nuclear quadrupole resonance (a review)

SOURCE: Pribory* i tekhnika eksperimenta, no. 1, 1964, 5-22

TOPIC TAGS: nuclear resonance, quadrupole resonance, nuclear quadrupole resonance, quadrupole resonance investigation, quadrupole resonance investigation equipment

ABSTRACT: Well-known phenomena of the nuclear quadrupole resonance are briefly described. The effect of apparatus factors upon the quadrupole-resonance curve shape is discussed. The application of a squegging oscillator in a super-regenerative spectrometer is described. The principle of Zeeman modulation is also mentioned. Stationary methods for observation of the nuclear quadrupole

Card 1/2

ACCESSION NR: AP4018356

resonance are set forth with a brief discussion of a number of electronic circuits used for this purpose. The principal connection diagrams of various self-quenched and externally-quenched superregenerators are given. In discussing pulse methods of studying the nuclear quadrupole resonance, their complexity is held as their chief shortcoming. The article is concluded with a brief description of the Zeeman effect in single crystals and a discussion of automatic Zeeman-spectrometers. The supporting material for this review is taken entirely from Western sources and some Soviet sources published in 1959-63. Orig. art. has: 15 figures and 12 formulas.

ASSOCIATION: Permskiy gosudarstvenny*y universitet (Perm' State University)

SUBMITTED: 15Jul63 DATE ACQ: 18Mar64 ENCL: 00

SUB CODE: PH, NS NO REF SOV: 022 OTHER: 071

Card 2/2

ACCESSION NR: AP4019269 S/0192/64/005/001/0053/0058

AUTHORS: Grechishkin, V.S.; Kyuntsel', I.A.

TITLE: Nuclear quadrupole resonance in molecular compounds of antimony trichloride and tribromide

SOURCE: Zhurnal strudturnoy khimii, V.5, no.1, 1964, 53-58

TOPIC TAGS: nuclear quadrupole resonance, antimony trichloride, tribromide, crystal structure, chemical bond, Hammett constant, antimony

ABSTRACT: Nuclear quadrupole resonance is used as a mechanism for studying the distribution of a heterogeneous electrical field in molecular complexes, which might be useful as organic semiconductors. The quadrupole nuclei in this case fulfill the role of some experimental charges, and if there are several of these charges in the complex, there is a possibility of measuring the gradient of the electrical field at various points. Nuclear quadrupole resonance of Cl^{35}, Sb^{121}, Sb^{123} and Br^{79} in crystals of 27 molecular compounds of $SbCl_3$ and

Card 1/3

ACCESSION NR: AP4019269

$SbBr_3$ are identified. The constants of the quadrupole reaction and asymmetry parameters are determined. The temperature dependence of frequencies Sb^{121} was studied. The rates of mean frequencies of rotary oscillations of molecules are derived. Observation of the quadrupole resonance itself in the complex indicates that it is free from heterogeneous crystals. Nuclear quadrupole resonance signals are not observed in the partial decomposition of the specimen. Data on nuclear quadrupole resonance indicates strong deformation of molecules of $SbCl_3$ and Sb^{123}. The variation of constants of the quadrupole reaction can be combined for a series of complexes with the Hammett constant for corresponding substitutes. Complexing leads to a strong variation of the character of the network oscillations. In many cases it should be known which atoms are acceptors in the complex and which are the donors. In the complexes of B.N. Menshutkin (Dvoyny*ye sistemy* trekhkhloristoy i trekhbromistoy sur'my* s benzolom i yevo zameshchenny*mi proizbodny*mi. SPb., 1912.)(O vliyanii zamestiteley na nekotory*ye reakstii benzola i yego zameshchenny*kh proizbodny*kh. SPb., 1912.) the antimony atom can be the acceptor. The chlorine atom or the bromine atom can also be an acceptor if the corresponding hy-

Card 2/3

ACCESSION NR: AP4019269

drocarbon is the donor of electrons. Thus, it is impossible to have a single schematic of forming Menshutkin complexes. "In conclusion the authors are grateful to student I.N. Shabanovoy for his help with some measurements." Orig. art. has: 3 tables, 2 figures, and 7 equations.

ASSOCIATION: Permskiy gosudarstvenny*y universitet (Perm' State University)

SUBMITTED: 29Oct62 DATE ACQ: 27Mar64 ENCL: 00

SUB CODE: CH NR REF SOV: 009 OTHER: 003

Card 3/3

GRECHISHKIN, V.S.; SOYFER, G.B.

Nuclear quadrupole resonance in chloro-derivatives of napthalene.
Zhur. strukt. khim. 5 no.6:914 N-D '64. (MIRA 18:4)

1. Permskiy gosudarstvennyy universitet.

ACCESSION NR: AP4028462 S/0181/64/006/004/1238/1240

AUTHORS: Grechishkin, V. S.; Zlatogorskiy, M. L.

TITLE: Influence of impurities on the chemical shift of nuclear magnetic resonance signals of sodium 23 in alkali-halide crystals

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 1238-1240

TOPIC TAGS: nuclear magnetic resonance, impurity chemical shift, sodium 23, alkali halide crystal

ABSTRACT: The effect of impurities on the NMR chemical shift of Na^{23} in alkali-halide crystals was investigated experimentally. The magnitude of the chemical shift

$$\sigma = \frac{\nu_k - \nu_p}{\nu_p},$$

where ν_k and ν_p are the NMR frequencies with a fixed external magnetic field in the crystal and in a dilute solution respectively. The use of aqueous solutions of

Card 1/2

ACCESSION NR: AP4028462

sodium chloride as a reference signal for measurement of σ in alkali-halide crystals was indicated by the fact that no concentration dependence was observed. The chemical shift was measured relative to the aqueous solution of sodium chloride in solid solutions of NaCl + NaBr in varying proportions. The experimental value of σ was reduced by roughly 2.5 times with only 10% impurity, and with larger concentrations (50%-70%) positive shifts were obtained. This is evidently due to the second-order quadrupole effect, since the introduction of bromine ions into the sodium chloride lattice disrupts the cubic symmetry about the sodium nuclei. Orig. art. has: 7 equations and 1 table.

ASSOCIATION: Permskiy gosudarstvennyy universitet (Perm' State University)

SUBMITTED: 07Oct63 DATE ACQ: 27Apr64 ENCL: 00

SUB CODE: GP NO REF SOV: 003 OTHER: 004

Card 2/2

ACCESSION NR: AP4039675 S/0181/64/006/006/1821/1824

AUTHORS: Aynbinder, N. Ye.; Grechishkin, V. S.

TITLE: A method of orienting monocrystals in quadrupole resonance

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1821-1824

TOPIC TAGS: nuclear quadrupole resonance, quadrupole coupling constant, asymmetry parameter, electric field gradient, spin Hamiltonian

ABSTRACT: A method is given for determining the orientation of the principal axes of the electric field gradient tensor in a monocrystal for spin I=5/2. The polar angle θ and azimuthal angle ϕ of the external magnetic field H_0 in the principal axis system are found from the equations

$$\cos\theta = \sqrt{\frac{AD+BC}{B+D}}; \quad \cos 2\varphi = \frac{C-A}{B(1-C)+D(1-A)},$$

where

$$A = \frac{14R^2 - 1000\sigma_3 - 5(1-\eta^2)}{42R^2}; \quad B = -\frac{\eta}{3}; \quad D = -\frac{2\eta}{3-\eta^2};$$

$$C = \frac{196(3+\eta^2)^2 - 52(3+\eta^2)R^2 + 162R^4 - 259R^2 - 200\sigma_4}{81(3-\eta^2)R^2},$$

$$R = \frac{4\pi H_0}{eQq_{zz}}.$$

Card 1/3

and μ is the nuclear magnetic moment. The quadrupole coupling constant eQq_{zz} and the asymmetry parameter η are found experimentally with no magnetic field. Diagonalizing the spin Hamiltonian matrix leads to a sixth order secular equation which can be written in the form

$$\lambda^6+a_1\lambda^5+a_2\lambda^4+a_3\lambda^3+a_4\lambda^2+a_5\lambda+a_6=0,$$

This is also the expansion of

$$(\lambda-\lambda_1)(\lambda-\lambda_2)(\lambda-\lambda_3)(\lambda-\lambda_4)(\lambda-\lambda_5)(\lambda-\lambda_6)=0,$$

where the energy eigenvalues can be expressed in terms of the experimentally observed resonance frequencies

$$\begin{aligned}
\lambda_6&=\frac{1}{6}(\nu_1+2\nu_2+3\nu_3+4\nu_4+5\nu_5);\\
\lambda_5&=\frac{1}{6}(\nu_1+2\nu_2+3\nu_3+4\nu_4-\nu_5);\\
\lambda_4&=\frac{1}{6}(\nu_1+2\nu_2+3\nu_3-2\nu_4-\nu_5);\\
\lambda_3&=\frac{1}{6}(\nu_1+2\nu_2-3\nu_3-2\nu_4-\nu_5);\\
\lambda_2&=\frac{1}{6}(\nu_1-4\nu_2-3\nu_3-2\nu_4-\nu_5);\\
\lambda_1&=\frac{1}{6}(-5\nu_1-4\nu_2-3\nu_3-2\nu_4-\nu_5).
\end{aligned}$$

ACCESSION NR: AP4039675

Thus the coefficients a_3 and a_4 can be found experimentally. It is concluded that θ and ϕ can be determined within 0.5°. Orig. art. has: 11 equations.

ASSOCIATION: Permskiy gosudarstvenny*y universitet im. A. M. Gor'kovo (Permsk State University)

SUBMITTED: 25Nov63 DATE ACQ: 19Jun64 ENCL: 00

SUB CODE: NP,SS NO REF SOV: 001 OTHER: 003

Card 3/3

ACCESSION NR: AP4043387 S/0181/64/006/008/2528/2530

AUTHORS: Grechishkin, V. S.; Gordeyev, A. D.

TITLE: Quadrupole relaxation in tetrachloronaphthalene crystals

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2528-2530

TOPIC TAGS: organic crystal, quadrupole relaxation, nuclear quadrupole resonance, chlorine, line splitting, spin spin relaxation

ABSTRACT: Nuclear quadrupole resonance of the Cl^{35} nucleus was investigated in 1,4,5,8-$C_{10}H_4Cl_4$. A frequency modulated super-regenerator was used to observe the nuclear quadrupole resonance (NQR) (V. S. Grechishkin, PTE, no. 2, 31, 1959). Two absorption lines were observed at 34,830 and 36,234 Mc for 291K and 35,238 and 36,768 Mc at 77K, with a considerable splitting (1.53 Mc at 77K and 1.404 Mc at 291K). To explain this effect, the sample was investigated in an NQR spin-echo installation. Measurement of the spin-spin

Card 1/2

ACCESSION NR: AP4043387

relaxation time has shown that this time differs for the two NQR lines in the tetrachloronaphthalene, thus indicating the presence of strong intermolecular interaction in this crystal. It is mentioned that such crystals very frequently have piezoelectric properties. Orig. art. has: 1 figure.

ASSOCIATION: Permskiy gosudarstvenny*y universitet (Perm State University)

SUBMITTED: 11Mar64 ENCL: 00

SUB CODE: SS NR REF SOV: 001 OTHER: 002

Card 2/2

L 16687-65 EWT(1)/EWT(m)/EWP(j)/EEC(t) Pc-4/Peb IJP(c)/RAEM(c)/SSD/SSD(a)/AFWL/ASD(a)-5 RM
ACCESSION NR: AR5000781 S/0058/64/000/010/D040/D040

SOURCE: Ref. zh. Fizika, Abs. 10D311

B

AUTHORS: Grechishkin, V. S.; Soyfer, G. B.

TITLE: Nuclear quadrupole resonance frequencies and the chemical bond

CITED SOURCE: Tr. Yestestv.-nauch. in-ta pri Permsk. un-te, v. 11, no. 2, 1964, 3-103

TOPIC TAGS: nuclear quadrupole resonance, chemical bond, absorption frequency, spectral characteristic, magnetic resonance

TRANSLATION: A review is presented of the main work on the application of nuclear quadrupole resonance for the investigation of chemical bonds in solids. A detailed summary is presented of all the experimental data on the absorption frequencies at different temperatures. The table lists the spectral characteristics of 751 compounds. The

Card 1/2

L 16687-65
ACCESSION NR: AR5000781

table of the NQR frequencies is used for a qualitative analysis. Bibliography, 209 titles.

SUB CODE: GP, NP ENCL: 00

Card 2/2

L 39385-65 EPF(c)/EEC(t)/EWT(1) Pi-4 IJP(c) GG/MM

ACCESSION NR: AR5004854 S/0058/64/000/011/E022/E022

SOURCE: Ref. zh. Fizika, Abs. 11E160

17
B

AUTHORS: Grechishkin, V. S.; Kyuntsel', I. A.

TITLE: Investigation of some molecular compounds by the nuclear quadrupole resonance method

CITED SOURCE: Tr. Yestestv.-nauchn. in-ta pri Permsk. un-te, v. 11, no. 2, 1964, 119-124

21

TOPIC TAGS: nuclear quadrupole resonance, molecular compound, chlorine bond, bromine bond, hybridization, quadrupole coupling constant

TRANSLATION: A study was made of nuclear quadrupole resonance (NQR) of Sb^{121}, Sb^{123}, Cl^{35}, and Br^{81} in 30 molecular compounds of $SbCl_3$

Card 1/2

L 39385-65

ACCESSION NR: AR5004854

0

and $SbBr_3$ with benzene and its substitute derivatives. The NQR signals were observed with a broadband NQR radiospectrometer. The observed change in the quadrupole-coupling constants of the Sb atoms is regarded from the point of view of the theory of donor-acceptor interaction. An estimate of the s-hybridization of the Sb-Cl and Sb-Br bonds is made for a series of complexes. In all complexes, an appreciable change was found in the asymmetry parameter η, possibly due to the distortion of the shape of the $SbCl_3$ and $SbBr_3$ pyramid. In several complexes, the temperature dependence of the NQR frequency was also investigated.

SUB CODE: GP, NP ENCL: 00

Card 2/2 nb

L 16686-65 EWT(m)/EPF(c)/EWP(j) Pc-4/Pr-4 RAEM(c(/ASD(a)-5 RM
ACCESSION NR: AR5000782 S/0058/64/000/010/D040/D040

SOURCE: Ref. zh. Fizika, Abs. 10D314

AUTHORS: Grechishkin, V. S.; Soyfer, G. B.

TITLE: Influence of hydrogen bonds on quadrupole interactions in chloral derivatives

CITED SOURCE: Tr. Yestestv.-nauchn. in-ta pri Permsk. un-te, v. 11, no. 2, 1964, 125-127

TOPIC TAGS: nuclear quadrupole resonance, hydrogen bond, line splitting, magnetic resonance

TRANSLATION: A multiplet structure, consisting of three lines whose frequencies decrease with increasing sample temperature, was detected in the NQR spectra, observed for the first time in chloral-ammonia and chloral-acetone. The splitting of the resonance lines is due to the interaction of the atoms entering in a hydrogen bond. An estimate of the value of this splitting, made within the

Card 1/2

L 16686-65
ACCESSION NR: AR5000782

framework of the electrostatic theory of the hydrogen bond, is close to the experimental result. A. Vashman.

SUB CODE: NP, OC ENCL: 00

Card 2/2